CNC-Technik

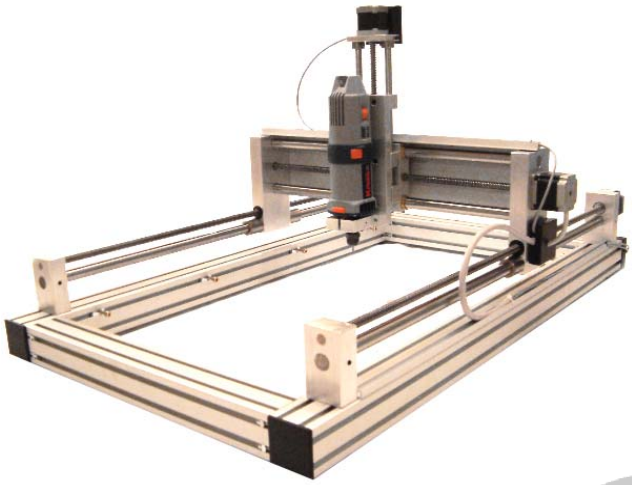
HEIZ

Steuerungen
Portalfräsmaschinen

Operating Instructions

CNC-Milling Machine HIGH-Z

S-400 / S-720 / S-1000



Vor Beginn aller Arbeiten
Betriebsanleitung lesen!

© H-E-I-Z CNC-Technik
Nellenkath 14
D-47608 Geldern (Germany)

Phone: +49 2831-13 32 36
Fax: +49 2831-13 32 37

e-mail: heiz-cnc-technik@online.de
Internet: www.cnc-step.com

Doc-ID: 0227 BA
2005-02-21

1 General 6
1.1 Symbol Legend 6
1.2 Information to the operating instructions 6
1.3 Liability and Warranty 7
1.4 Spare Parts 7
1.5 Copyright-Protection 7
1.6 Waste Disposal 8
2 Security 9
2.1 General 9
2.2 Responsibility of the Operating Company 9
2.3 Appropriate Use 10
2.4 Operational Safety 10
2.5 Personal Protection Equipment 10
2.6 Possible dangers arising from the machine 11
2.6.1 Equipment with milling motor and/or servo motor control 11
2.6.2 Equipment with knife holder 11
2.7 EMERGENCY-STOP button 12
2.8 System Control 12
2.9 Operating Personnel 12
2.10 Steps to be taken in case of danger or accident 13
3 Technical Data 15
3.1 Weights and Measurements 15
3.2 Gear 17
3.3 Characteristics 17
4 Arrangement and function 18
4.1 Arrangement 18
4.2 Name Plate 19
4.3 Function 19
4.4 Accessories (optional) 21
4.4.1 Servo motor control 21
4.4.2 Working Desks 21
4.4.3 Tool 21
4.4.4 Z-Kit 22
5 Transport, Packing and Storing 23

5.1 Transport 23
5.2 Safety instructions 23
5.3 Transport inspection 24
5.4 Packing 24
5.5 Storing 24
6 Installation and beginning of operation 25
6.1 Before Installation 25
6.2 installation of the CNC-Milling Machine 25
6.2.1 Place of installation 26
6.2.2 Screw clamping torque 26
6.2.3 Temperature of Surrounding Area 26
6.3 Installation 26
6.4 EMERGENCY-STOP button 27
6.5 Electric Connection 27
6.5.1 Connection of the servo motors 27
6.5.2 Connection of the servo motor control 28
6.5.3 Connection of the tools 28
6.6 Working Desk 29
6.7 Assembly of the tools 29
6.8 Beginning of operation 30
7 Operation 31
7.1 Operating Personnel 31
7.2 Temperature of surrounding area 31
7.3 Clamping of Working pieces 31
7.4 Operating control 31
7.5 Operation of the Plant 32
7.6 Exchange of the tools 32
7.7 Accessory (optional) 32
8 Maintenance 34
8.1 Security 34
8.2 Lubricants 35
8.3 Maintenance Plan 36
8.4 Maintenance works 36
8.5 Measurements after maintenance works 37

9 Disturbances 38

9.1 Steps to be taken in case of disturbances 38

9.2 Disturbances 38

10 Spare parts 39

1 General

1.1 Symbol Legend

In these operating instructions, important security- and device-related indications are marked by symbols. These indications have strictly to be observed in order to avoid accidents as well as damages to persons or objects.

WARNING!

This symbol indicates dangers, which could lead to impairment of health, injuries, irreversible physical injuries or even to death. Please urgently observe the indications regarding work security and behave exceptionally cautious in these cases.

WARNING! Danger by electricity!

This symbol calls attention to dangerous situations by electricity. In case of ignorance of the security indications, the danger of serious injuries or of death is alert. The works are allowed to be executed by qualified electricity experts only.

ATTENTION!

In case indications marked with this symbol are ignored, damage of malfunctions and/or breakdown of the machine can be the consequence.

INDICATIONS!

This symbol highlights tips and information, which have to be observed in order to ensure a trouble-free and efficient operation.

1.2 Information to the operating instructions

The operating instructions serve the personnel as an important source of information and reference book for the installation and operation of the milling machine. It should enable the personnel to work appropriately and safely.

The pre-condition is the knowledge of the security tips, which have to be observed at the installation and the operation as well as the maintenance of the machine. Therefore, the operating instructions start with the chapter “Security”. The following chapters show the further main topics for the information of the personnel.

In order to avoid faulty operation, the operation instructions have to be stored close to the machine and have to be accessible to the personnel at any time. The rules for accident prevention and the general safety regulations have urgently to be observed during operation of the machine.

INDICATIONS!

The graphical presentments in these operating instructions might deviate from the actual execution of the machine.

In addition to these operating instructions, also those of the individual implemented components are valid. The indications stated herein – especially the safety regulations – have to be observed.

1.3 Liability and Warranty

All details and indications for the operation, maintenance and cleaning of the machine have been made under consideration of our knowledge and experiences collected up to now.

We preserve the right for technical amendments due to further development of the CNC-Milling Machine.

Translations are also made to our best knowledge. However, we exclude the liability for translation errors. The German version of the operation instructions shall prevail for warranty purposes.

The presented texts and drawings do not necessarily correspond to the scope of delivery. The drawings and graphics are not in the scale 1:1.

These operating instructions have to be carefully read before start of operation!

The manufacturer does not bear any liability for any damages or disturbances resulting from non-observance of the operation instructions.

It is strictly forbidden to make these operating instructions accessible to any third party; non-observance obliges to claim of damages.

1.4 Spare Parts

Please only use original spare parts of the manufacturer.

ATTENTION!

Faulty or defective spare parts of external manufacturers may lead to damages of the machine. In case spare parts of external manufacturers are used, all obligations of the manufacturer, e.g. warranties, service contracts etc. are void without prior notice.

1.5 Copyright-Protection

These operating instructions have to be kept confidential. They have only to be used by authorized persons. Third parties shall only be granted accession after written approval of manufacturer.

All documents are protected according to the German Copyright Act.

Circulating or copying of documents, even only in parts, as well as using and communicating the contents of those, are forbidden – unless explicitly differently declared. Non-compliance is condemnable and obliges to damage claim.

We reserve the right of application of the industrial property rights.

1.6 Waste Disposal

– Preservatives and cleaning supplies have to be disposed according to the current environment protection law.

– Lubricants have to be disposed according to the current environment protection law.

2 Security

This section gives an overview about all important safety aspects.

Additionally, the individual chapters show precise safety instructions and are marked with symbols. Further more, pictograms and signs on the machine have to be observed and have to be kept in readable condition permanently.

The observance to all safety instructions enables the personnel to work under optimum protection against dangers and ensures a safe and trouble-free operation of the machine.

2.1 General

The machine is reliable in accordance with the current technical regulations. However, the machine may arouse dangers in case it is operated by unqualified personnel, or in case of improper use or in case of inappropriate use.

Each person being instructed to work at or with the machine, has to read and understand the operating instructions first. This also applies in case the respective person has already worked with a similar machine or has been qualified by the manufacturer.

The knowledge of the content of the operating instructions is a pre-condition to protect personnel against dangers as well as to avoid mistakes and therefore to operate the machine safely and without disturbances.

For the avoidance of dangers and for assurance of an optimum performance no amendments are allowed to be made to the machine, which have not been explicitly approved by the manufacturer.

All safety instruction signs and operation instructions signs at the machine have to be kept in readable condition at any time. Damaged or illegible signs have to be replaced immediately.

The technical adjustment figures mentioned in the operating instructions have to be observed.

We recommend that the operating company asks for written acknowledgement from the personnel having knowledge of the content of the operating instructions.

2.2 Responsibility of the Operating Company

These operating instructions and the ones of the implemented components have to be stored close to the machine and have to be made accessible to the staff of installation, operation, maintenance and cleaning at any time.

The machine is only allowed to be operated in technically proper and reliable condition. The safety installations have to be accessible at any time and have to be regularly checked, whether they are in faultless function regularly.

The information made according to the operational safety are based on the regulations of the European Union valid at the time of manufacturing of the machine. During the complete operating time of the machine, the operating company is obliged to assess differences to the current status of the safety regulations and to adjust them to the new regulations. Outside the European Union, the regulations valid at the place of installation and the regional regulations have to be observed.

In addition to the operational safety instructions mentioned in these operation instructions, the generally valid safety regulations and rules for accident prevention as well as the current environment protection law have to be observed.

The operating company and the personnel authorized by him are responsible for the proper operation of the machine as well as the clear determinations regarding the responsibility for installation, operation, maintenance and cleaning of the machine.

The details made in the operating instructions have to be observed completely and without exceptions.

Further more, the operating company has to make sure that

– in an evaluation of possible dangers in accordance with labour protection laws, further dangers have to be determined, which may occur due to particular working conditions at place of operation.
– all further instructions and safety instructions arising out of the evaluation of possible dangers at the working places at the machine have to be stipulated in operating instructions in accordance with the regulations regarding working appliances.

2.3 Appropriate Use

The manufacturer only ensures the operational liability when the machine is used appropriately and in accordance with the operating instructions.

Among ‘appropriate use’ also counts the observance to instructions regarding the assembly, operation, maintenance and cleaning.

Every use other than that is forbidden and is defined as ‘not appropriate’! Every entitlement to damages against the manufacturer and/or his representatives because of inappropriate use will be excluded. The operating company alone is liable for all damages arising from inappropriate use.

The machine is implemented in a plant and has no separate control. There is no operating personnel necessary during operation. The operating company is obliged to install the adequate safety installations making it possible to stop the machine immediately in case of danger or disturbance.

2.4 Operational Safety

Danger to persons and/or to the machine can be avoided by the observance to the operational safety instructions.

Non-observance to the operational safety instructions may cause damages to persons and objects by mechanical or electric impacts or the breakdown of the machine.

Non-observance to the operational safety instructions leads to loss of every damage claim.

2.5 Personal Protection Equipment

As a basic principle, persons have to wear the following items while working at the machine:

– tight working clothes
(low tensile strength, no loose sleeves, no rings or other jewellery, etc.)

– Protection Glasses
for the protection of the eyes against splashing objects

– Protection Gloves
for the protection of the skin against injuries

– Protection Shoes
for the protection against heavy objects falling down and slipping on slippery ground

– Ear Protection/ Ear Muffs
for the protection against hearing damages at a noise pressure level of above 80 db(A)

2.6 Possible dangers arising from the machine

The machine has undergone an analysis of possible dangers arising out of the operation of the machine. Its construction and execution has been updated to the current technical knowledge.

However, a rest risk is remaining!

The machine shows sharp edges.

WARNING! Danger of injury!

Sharp-edged body parts and sharp edges may cause injuries to skin. Therefore, protection gloves have to be worn!

2.6.1 Equipment with milling motor and/or servo motor control

The machine is working under high voltage.

WARNING! Danger by electricity!

The electric energies may cause heaviest injuries. In case of damages to insulation or individual parts of machine, there exists the danger of life because of electricity.

Therefore:

- **Before maintenance, cleaning and repair works, the main switch has to be switched off and has to be made safe against restarting.**
- **The machine has to be switched dead during all works at the electric part of the machine.**
- **No safety installations have to be deleted or to be put out of operation by any amendments.**

2.6.2 Equipment with knife holder

The machine is working with sharp blades.

WARNING! Danger of injury!

Sharp blades may cause injuries to skin. Therefore, protection gloves have to be worn while working at the machine.

2.7 EMERGENCY-STOP button

The machine is implemented in a plant and has no separate control. The operating company is obliged to provide for an installation of an EMERGENCY-STOP button in accordance with the current rules for accident prevention. The operating staff has to be instructed about the location and functioning of the EMERGENCY-STOP button by the operating company.

2.8 System Control

The machine is implemented in a plant and has no separate control. The operating company is obliged to install the right safety installations in accordance with the current regulations for accident prevention.

In this connection the following items have to be observed:

– In case of loss of power, the machine control has to cut all electric lines. After power fail restart the machine has to function smoothly again without showing any deviations from normal operation.

– The control of the machine has to determine immediately a short circuit an has to cut immediately all lines.

– Safety installation of the machine have to be implemented in the machine control.

2.9 Operating Personnel

Operation and maintenance of the machine is exclusively allowed to authorized, instructed and qualified expert personnel. The personnel must have knowledge of the possible dangers while working at the machine.

Among ‘qualified expert personnel’ counts who has been informed about the instructed tasks and possible dangers in case of inappropriate use of the machine, about the safety installations as well as the safety provisions.

Among qualified expert personnel counts who can recognize possibly occurring dangers based on his qualification, knowledge and experience as well as knowledge of the regulations.

Should the personnel have not the necessary knowledge, the respective qualification has to be made.

The responsibilities for operation and maintenance have to be clearly determined and complied with. This is also of importance because of reasons of security, as unclear defined competences may lead to disturbances.

Only reliable personnel is allowed to operate the machine. All works affecting the security of persons, the environment or the machine have to be neglected.

Persons being influenced by drugs, alcohol or pharmaceuticals reducing the ability to respond, are not allowed to do any work at/with the machine.

Regarding the minimum working age, the regulations for working adolescents of the respective country have to be observed when choosing the personnel.

The operating company has to pay attention that no person being not authorised is working with the machine. Not authorized persons, e.g. visitors, have to keep an appropriate security distance to the machine in order to avoid accidents.

The operating company is obliged to immediately announce amendments at the machine which affect the security of the machine.

2.10 Steps to be taken in case of danger or accident

In case of danger or accidents, the machine has to be turned off via EMERGENCY-STOP button immediately.

This may be done either by opening a protection door provided with security switches or a protection wafer executing the EMERGENCY-STOP function through opening.

Security devices provided with EMERGENCY-STOP functions are only allowed to be activated in EMERGENCY situations.

The safety devices are not allowed to be used for the normal stopping of the machine.

Be constantly aware of accidents or fire!

First aid equipment (ambulance box, eye liquid container, etc.) and fire extinguisher have to be kept in accessible distance.

The personnel has to be familiar with the handling and the location of devices for security-notification of accidents as well as first aid and rescue. This is to ensure the protection against dangers and optimum aid in case of accidents.

3 Technical Data

3.1 Weights and Measurements

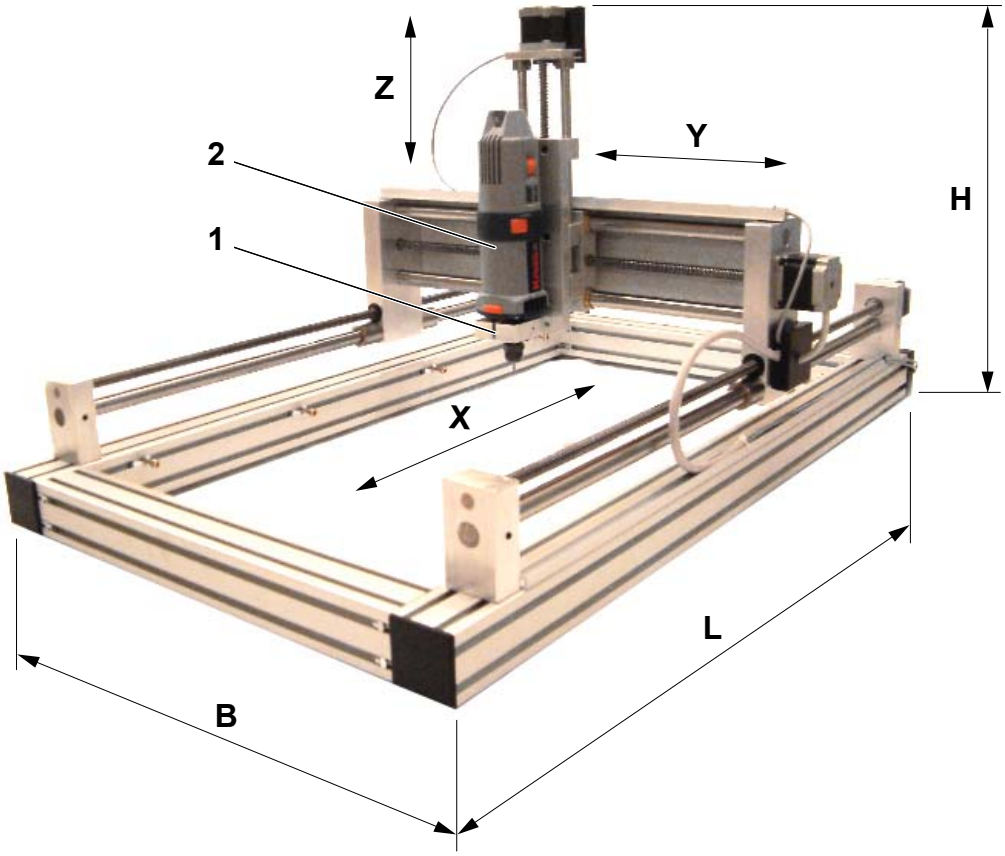


Illustration No. 1: Measurements

Model HIGH-Z …			S-400	S-720	S-1000
Length	L	mm	750	1070	1350
Width	B	mm	570	690	840
Height	H	mm	550	550	550
Clamping Surface		mm	730 x 380	1050 x 500	1330 x 680
Working area	X Y Z	mm mm mm	400 300 100	720 420 110	1000 600 110
Passage Height		mm	100	100	100
Tool-Carrier (Euro-Neck)	(1)	mm	ø 43	ø 43	ø 43
Weight without Working Desk and Tool (2)		kg	24	32	41

The tool (2) is optional accessory and not part of the CNC-Milling Machine. The tool has to be installed by operating company.

3.2 Gear

The gear for the sliding carriage is effected by 4 Stepping Motors:

1 2 stepping motors for the X-Axis

2 1 stepping motor for the Y-Axis

3 1 stepping motor for the Z-Axis

motor performance: 2,1A
(each stepping motor)

Steps/Revolution: 1600 (⅛-Step) with our optional available Micro-Step Controller

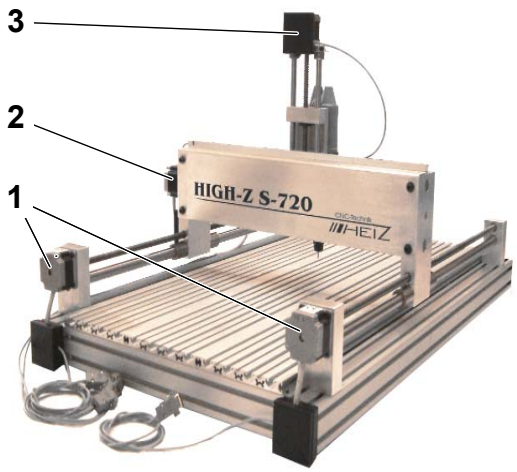


Illustration No. 2: Stepping Motors

3.3 Characteristics

Model HIGH-Z …		**S-400**	**S-720**	**S-1000**
max. *Verfahrgeschwindigkeit* (rapid power)	mm/min	1500	1250	1000
programmable dissolution	mm	0,001875	0,001875	0,001875
repeat accuracy	mm	0,03	0,03	0,03
operating temperature/ temperature of surrounding area	°C	20-25	20-25	20-25

4 Arrangement and function

4.1 Arrangement

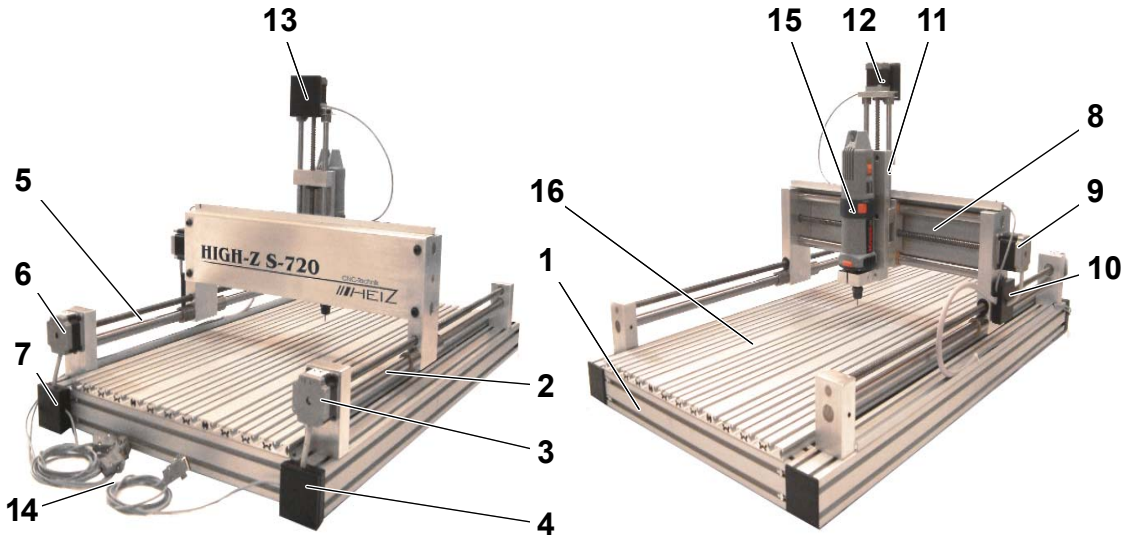


Illustration No. 3: Components

1 Frame

X-Slide Carriages (X1 and X2):

2 Linear Guide ways ø20mm; Trapezium Spindle TR12x3

3 Stepping Motor (X1)

4 Terminal Box for (3)

5 Linear Guide ways ø20mm; Trapezium Spindle TR12x3

6 Steppping Motor (X2)

7 Terminal Box for (6)

Y-Slide Carriages:

8 2 Linear Guide ways ø20mm; Trapezium Spindles TR12x3

9 Stepping Motor (Y)

10 Terminal Box for (9)

Z-Slide Carriages:

11 2 Linear Guide ways ø12mm; Trapezium Spindles TR12x3; Tool Carrier

12 Stepping Motor (Z)

13 Terminal Boxes for (12)

Miscellaneous:

14 4 Connection Cables for Stepping Motors

15 Tools (optional accessory, e.g. Milling Motor)

16 Working Desk (optional accessory, e.g. T-Groove-Plate)

The linear tracks are grinded and hardened. The guide ways are executed by highly resistant “Sinter” floating-bearings. The “Sinter” floating-bearings are maintenance-free and self-lubricant. The trapezium spindles are provided with ball-bearings. They go through Nylatron nuts. These Nylatron nuts are maintenance-free.

4.2 Name Plate

The name plate (1) is fixed to the frame (see illustration).

The name plate contains the following details:

– Manufacturer

– Type-Marking

– Serial-No.

– Year of Manufacture

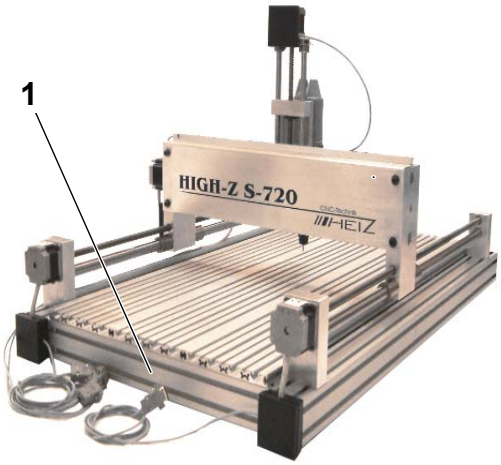


Illustration No. 4: Place of Name Plate

4.3 Function

The CNC-Milling Machine may be used as milling machine, engraving machine or cutting plotter.

The following material may be machined:
- plastics
- wood
- Non-ferric metal (e.g. aluminium, messing etc.)

The CNC-Milling Machine is also applicable for
- drilling of blanks
- isolation mill
- Cutting of plastic films.

The CNC-Milling Machine alone is still not functional! For the operation as a milling machine, engraving machine or cutting plotter, the following components are additionally necessary:

– **Software**, which has to be loaded into a Standard-PC and this way becomes an all-purpose stepping motor-NC-control, e.g. CNC-Profi, PC-NC

– **Control** for energising the stepping motors (4-Channel-control)

– **Tool** for machining of the materials or work-pieces, e.g. milling motors, knife holder, etc.

The components are available as optional accessory (see section "Accessories").

INDICATION!

The CNC-Milling Machine is arranged within a plant. That means that only after fitting out with software, control and tools, the CNC-Milling Machine can be operated. The operating company is responsible for secure operation of it.

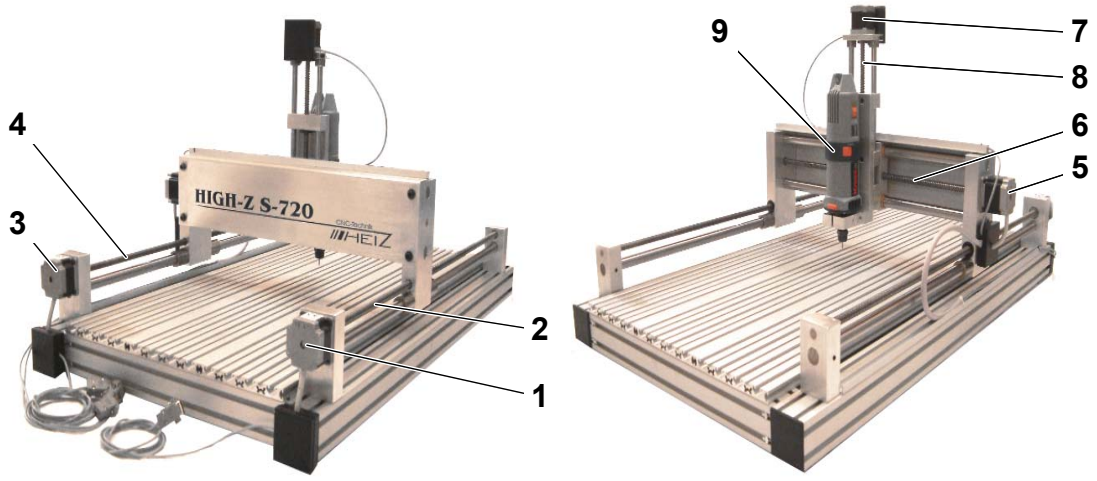


Illustration No. 5: CNC-Milling Machine

The drawings or texts are created in a design-/graphic-program (e.g. CorelDraw, CAD-Program, etc.) and stored in HPGL data format. These files are transferred to the CNC-Software PC-NC (optional accessory).

In this software all settings (e.g. *Verfahrgeschwindigkeiten*, scale, sequence of milling, dipping depth of tools etc.) for the further procedure. These dates are sent to the respective stepping motor of the CNC-Milling Machine by the stepping motor control.

A transfer from a turning into a linear movement is effected by the stepping motors and the trapezium spindle over the linear guide ways:

– For the X-direction:
stepping motors (1 and 3) and trapezium spindles (2 and 4).
– For the Y-direction: stepping motor (5) and trapezium spindle (6).
– For the Z-direction: stepping motor (7) and trapezium spindle (8).

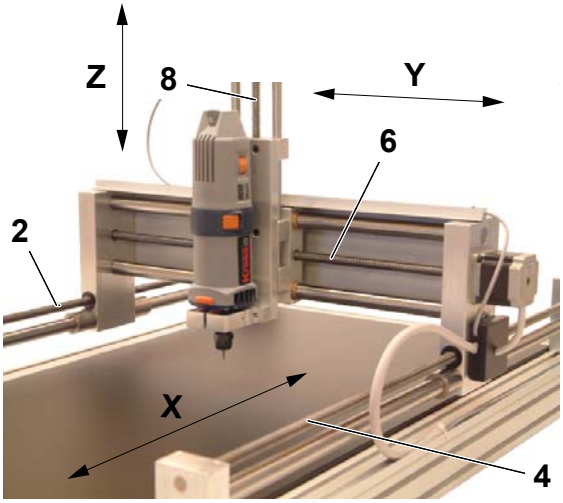


Illustration No. 6: X-,Y- and Z-direction

4.4 Accessories (optional)

The accessories listed hereafter are only a small choice and are optional. Please ask manufacturer for further accessories.

1 CNC-Software PC-NC (comes with the machine), (separate operating instructions)

2 Stepping motor control (separate operating instructions)

3 working desk (diverse executions available)

4 Tool (diverse tools available)

5 Z-Kit (not shown in Illustration No. 7)

6 Glaskit for engraving glas and Materials like stone. (not shown in illustration No. 7)

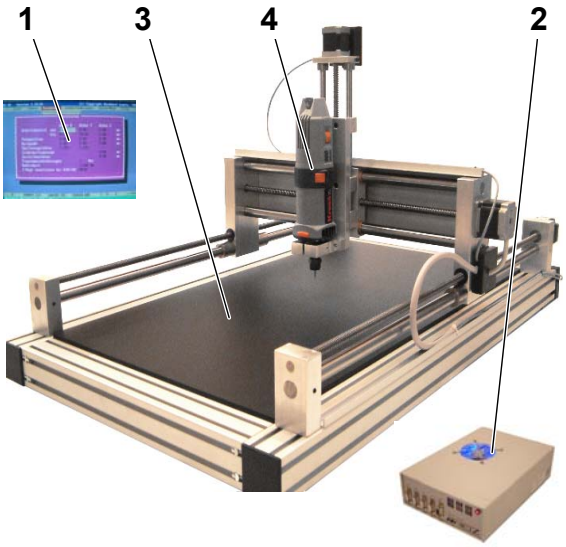


Illustration No. 7: Optional Accessories

4.4.1 Servo motor control

Micro-Step-control, 4-channel; 0,5 to 2,1A (separate operating instructions).

Micro-Steo-control, 5-channel; 0,5 to 2,1A (separate operation instructions).

4.4.2 Working Desks

– 3-divided T-Groove-desk of massive anodised aluminium incl. 20 self clamping Groove Stones with M6-thread.

– Vakuum disc

4.4.3 Tool

1 Milling motor (separate operating instructions)

2 Knife holder for cutting of plastic films

3 Holding down clamp for engraving works (not shown in Illustration No. 8)

Illustration No. 8: Tool (optional accessory)

4.4.4 Z-Kit

The Z-Kit consists of 4 profile pieces of the length of XX mm, which are screwed under the frame of the CNC-Milling Machine. The CNC-Milling Machine therefore sticks out from the ground. This makes possible a clamping and machining of working pieces in the bench vices.

5 Transport, Packing and Storing

5.1 Transport

Urgently mind the weights and measurements during transport.

ATTENTION! Heavy Load!

Weight of he CNC-Milling Machine without accessories:

24kg (HIGH-Z S-400)

32kg (HIGH-Z S-720)

41kg (HIGH-Z S-1000).

Please only use appropriate means of transportation and hoisting means for the transport of the CNC-milling machine. Please only grip at frame!

5.2 Safety instructions

WARNING! Danger of injury!

During lifting, swivelling and lowering the danger of injury exists by falling objects. The machine may be damaged or destroyed by inappropriate transport.

Therefore, the following safety instructions have to be paid attention to:

- **only use permitted hoisting devices and slinging means with sufficient lifting capacity.**
- **only fasten machine at designated suspension points, NOT at preceding machine parts or at eyes of attached machine parts. Pay attention to a safe fitting of the slinging means!**
- **Ropes and belts have to be equipped with snap hooks. Use NO slightly ripped ropes or defective ropes. Do NOT fasten ropes and belts at sharp edges, do not knot or swivel. While attaching keep in mind the centre of gravity of the machine.**
- **Do not lift, swivel or lower load above the heads of persons,.**
- **Always move the machine with highest attention and accuracy.**

WARNING! Danger to life!

Schwebende Lasten können herab fallen und zu schweren Verletzungen führen. Beim Transport mit Hebezeugen nicht unter schwebende Lasten treten!

5.3 Transport inspection

Please check the delivery immediately after receipt for completeness and possible damages caused by transport.

In case of externally recognisable transport damages, please do not accept delivery or only under reservation. Note extent of damage on transport documents/delivery note of the forwarding agent. Induce customer complaint.

Complain about hidden damages as soon as you recognise them as customer complaints can be asserted only within the currently valid time limits.

5.4 Packing

INDICATION! Environmental Protection!

Packing materials are precious raw materials. In many cases these may be used further on can be sensibly re-processed and recycled..

In case there should exist no agreement concerning withdrawal of the packing material, please separate material by size and sort and try to give away for further use or recycling.

ATTENTION!

Always dispose of the packing material environmentally friendly and in accordance with the currently valid environment protection regulations. Recycling companies may also be authorised.

5.5 Storing

While storing packages until assembly, please always keep close and under observance of the indications made in the installation- and storing labels at the outside.

Store packages only under following conditions:

- Do not camp out.
- Store dry and dust-free.
- Do not expose to aggressive media.
- Protect from solar radiation.
- Avoid mechanical agitation.
- Storing temperature: 15 to 25°C
- Relative air humidity: max. 60%
- During longer lasting storage (> 3 months), please check regularly general condition of all machine parts as well as the packing. If necessary, repair or modernise the preservation.

6 Installation and beginning of operation

6.1 Before Installation

Please check the machine of completeness and technically faultless condition.

WARNING! Danger of injury!

Incomplete, faulty or damages machines may lead to serious injuries and/or damages to objects.

Only assemble fully functioning parts and components!

Before assembly of the machine please observe:

- Before starting, please provide for sufficient space for the assembly works.
- Attention at sharp-edged parts! Danger of injury!
- Observe cleanliness and tidiness at place of assembly! Loosely stapled or spread parts and tools are possible sources of accidents!
- Components have to be assembled appropriately. Faulty fixed components may fall down or tumble and cause serious injuries.

6.2 installation of the CNC-Milling Machine

WARNING! Danger of injury!

Inappropriate assembly may lead to serious injuries and/or damages to objects.

Installation of machine only by qualified expert personnel under observance to the security regulations!

Observe weights and measurements during installation.

ATTENTION! Heavy Load!

Weight of the CNC-Milling Machine without accessories:

24kg (HIGH-Z S-400)

32kg (HIGH-Z S-720)

41kg (HIGH-Z S-1000).

Please only use appropriate means of transportation and hoisting means for the transport of the CNC-milling machine. Please only grip at frame!

6.2.1 Place of installation

ATTENTION!

The CNC-Milling Machine has to be assembled on a smooth area.
Thus, deformations within the CNC-Milling Machine can be avoided and an exact machining of the working pieces is possible.

By application of a Z-Kit (optional accessory) the CNC-Milling Machine can be built-up a little bit off the ground. This makes possible a clamping and machining of working pieces in the bench vices.

The CNC-Milling Machine can also directly on big working pieces (e.g. body of the dimension 1x2x3m) put on.

WARNING! Danger of injury!

During attachment of the CNC-Milling Machine on a working piece, the CNC-Milling Machine has to be secured against shifting.

6.2.2 Screw clamping torque

ATTENTION! Do not retighten screws!

All screws at the CNC-Milling Machine have been tightened before delivery with the respective turning moment.
Additional tightening leads to unintentional tensions within the CNC-Milling Machine and to an inaccurate machining of the working pieces.

6.2.3 Temperature of Surrounding Area

During operation of the CNC-Milling Machine/machine a temperature of the surrounding area of 20-25°C has been kept.

Individual components have different coefficients of expansion. At a temperature of the surrounding area of 20-25°C it is secured that no inaccurateness occurs during machining.

6.3 Installation

WARNING! Danger of injury!

Only qualified expert personnel is allowed to execute setting-up and assembly-works under observance of the current security regulations.

6.4 EMERGENCY-STOP button

The machine is implemented in a plant and has no separate control. The operating company is obliged to provide for instalment of EMERGENCY-STOP buttons in accordance with the valid rules for accident prevention. The operating staff has to be informed about the way of functioning of the EMERGENCY-STOP button.

The EMERGENCY-STOP button is possible to connect by the plug-in point (ST) of the stepping motor control (1).

Please read the instructions from the controller for details of cabeling.

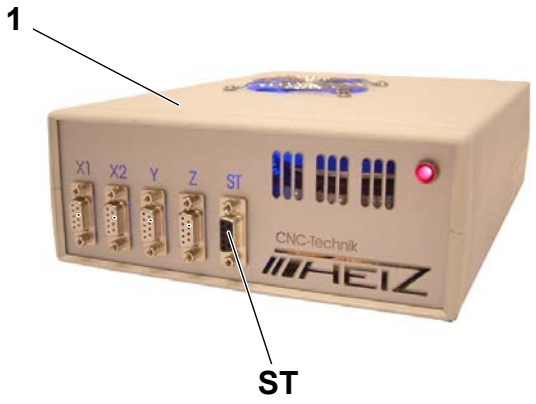


Illustration No. 9: Stepping motor control

6.5 Electric Connection

WARNING! Danger by electricity!

Works at electrical devices are only allowed to be done by qualified expert personnel under observance of the valid security regulations.

Before start of work, please switch off the electric feed-in and secure against re-setting.

6.5.1 Connection of the servo motors

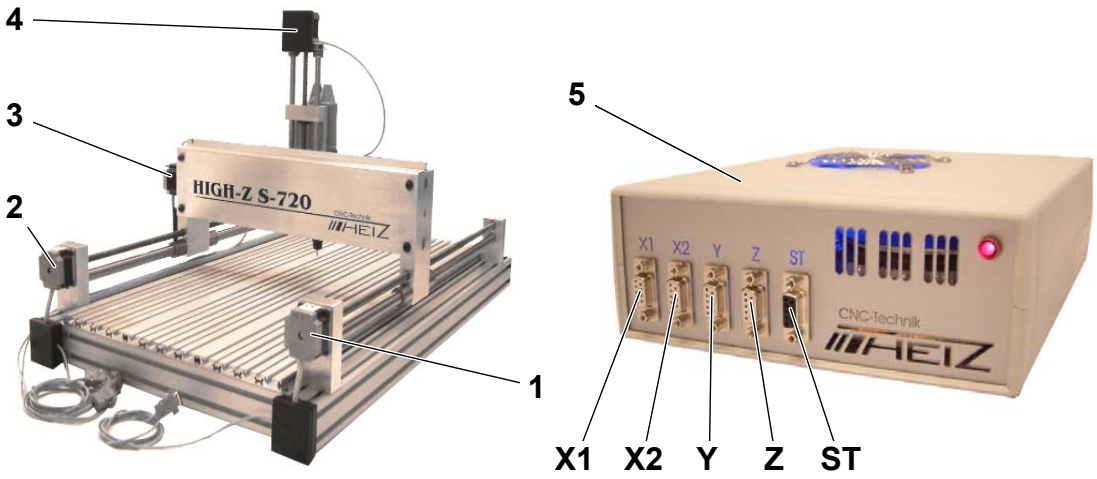


Illustration No. 10: CNC-Milling Machine and Stepping motor control

The stepping motors are to be connected to the stepping motors control as follows (5):

– Stepping motor (1) to plug-in point (X1)
– Stepping motor (2) to plug-in point (X2)
– Stepping motor (3) to plug-in point (Y)
– Stepping motor (4) to plug-in point (Z)

Afterwards, the limit switch, the reference switch and the EMERGENCY-STOP button have to be plugged in (ST).

Note: The connections of stepping motor 1 and 2 may be exchanged between the plug-in points X1 and X2.

WARNING! Danger of stumbling or falling!
Lines and/or cables laid on the ground have to be covered so that going over them will not cause any danger.

6.5.2 Connection of the servo motor control

The connection of the stepping motor control to the electric feed-in (mains supply) have to be effected in accordance with the respective information of the operating instructions of the stepping motor control.

6.5.3 Connection of the tools

The connection of the tools to the feed-in (mains supply) has to be effected in accordance with the respective information of the operating instructions of the tools.

6.6 Working Desk

The Working Desk has to be adapted according to mounting area:

Working Desk for		HIGH-Z S-400	HIGH-Z S-720	HIGH-Z S-1000
Length	mm	608	928	1208
Width	mm	390	510	660

The Working Desk (e.g. base plate) is laid loosely onto the 10 Supporting Points (1) in the frame.

Please see section “Operation – clamping of working pieces” for further possibilities.

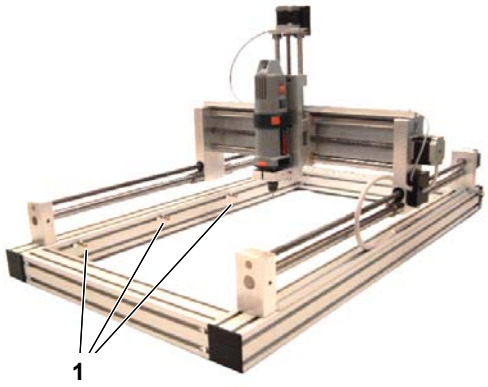


Illustration No. 11:Supporting Points

6.7 Assembly of the tools

Put in tools (Milling motor, Knife Holder, etc.) into the tool holder at the Z-Slide (Euro-Neck). Tighten the screw (1) with suitable tool (1).

WARNING! Danger of injury!

Inappropriately tightened tool may fall down or overturn and may lead to serious damages of persons- and/or objects. Professional assembly under observance of the security regulations.

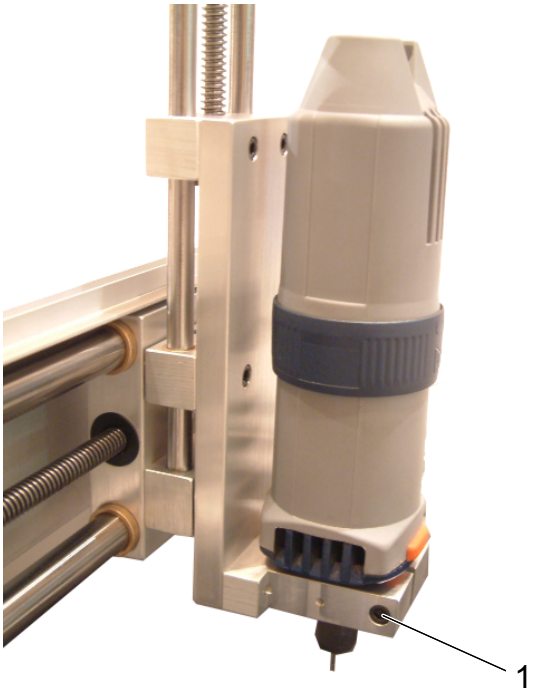


Illustration No. 12: Tool holder at Z-Slide (example: milling motor)

6.8 Beginning of operation

WARNING! Danger of injury!

The beginning of operation has to be done by qualified expert personnel under observance to the security regulations only!

To be observed before beginning of operation of machine or plant:

- assure that no tools or other foreign substance are in the machine/plant.
- Check the machine and all other parts which have to be tight.
- Please check all electric connections whether they are correctly assembled and tight.
- Check conformity of electric feed-in with information and connected loads of machine.
- Check whether security devices are functioning.

For the beginning of operation of the machine the following steps have to be done

► **under observance of all security regulations and the information in chapter "2. Security"; and**

► **under observance of the operating instructions of the components (optional accessories) and the advices given therein:**

– Connect the CNC-Milling Machine to the stepping motor control

– Install software and put into operation

– Install Stepping motor control and put into operation

– Install tools and put into operation

The beginning of the operation of the machine will be executed by the software.

Under observance of all security regulations, the machine within the plant can now be operated.

7 Operation

7.1 Operating Personnel

During operation of the CNC-Milling Machine/plant dangers may occur. Inappropriate operation and handling may lead to serious injuries.

During appliance of the CNC-Milling Machine/plant, the regulations for accident prevention have to be observed at any time. Only qualified expert personnel is allowed to operate it.

Access shall strictly be denied to unqualified expert personnel.

7.2 Temperature of surrounding area

During operation of the CNC-Milling Machine/plant, a temperature of the surrounding area of 20-25°C has to be kept.

Individual components have different coefficients of expansion. At a temperature of the surrounding area of 20-25°C it is secured that no inaccuracy occurs during machining.

7.3 Clamping of Working pieces

Different working desks may be used for clamping of working pieces (please also see optional accessories).

The Working Desk has to be adapted according to the clamping area:

Working Desk for		**HIGH-Z S-400**	**HIGH-Z S-720**	**HIGH-Z S-1000**
Length	mm	730	1050	1330
Width	mm	320	480	640

Clamping of flat and complex working pieces:
Fasten an MDF-board (medium dense fibre board) on the base plate, mill it over and fix the working pieces at it (e.g. with threaded insert for wood and with mounting link).

Clamping of flat material or of material for engraving:
Fasten an MDF-board (medium dense fibre board) on the base plate and on it a plastic laminated board. Use a holding down clamp for engraving works (optional accessory). This was it can be achieved that the engraving material always lays smoothly on the base and different engraving depths can be avoided.

7.4 Operating control

This CNC-Milling Machine has no separate operating control.

Operation will be effected by the software and control or by the tool. Regarding the operation of these components (optional accessory) please pay attention to the respective operating instructions.

7.5 Operation of the Plant

For the operation no special CNC-programming knowledge is necessary.

The CNC-Software PC-NC and the stepping motor control assume the control of the operation, i.e. the operating process (see the respective operating instructions).

In order to achieve a durable economic life of the mechanical components, the max. express speed should be not higher than 80% of the stated figures (see section “Characteristics”).

WARNING! Danger of injury!

Urgently observe that no parts of the body come into the danger zone of the CNC-Milling Machine at any time. Save the working area from unintended access to persons.

The CNC-Milling Machine and the tools may start unexpectedly, change their direction or stop.

WARNING! Danger of injury!

Always wear personal protection equipment:

- protection glasses for the protection of the eyes against splashing objects.
- protection gloves for the protection of the skin against injuries.
- Protection Shoes for the protection against heavy objects falling down.

WARNING! Danger by electricity!

Mind the laying of the cables and the safe appliance of the plugs during operation.

7.6 Exchange of the tools

When exchanging the tools, always switch off the main switch and make safe against restarting.

7.7 Accessory (optional)

ATTENTION!

Observe the operating instructions of the components (optional accessory)!

The operation of the optional accessories (software, stepping motor control, tools) have to be executed according to the respective operating instructions.

8 Maintenance

8.1 Security

Assembly-, servicing-, maintenance- and cleaning works are only allowed to be executed by qualified expert personnel, which has been qualified for this job.

Among qualified expert personnel counts who can judge the works at the machine and recognise possibly occurring dangers, based on his qualification, knowledge and experience as well as the knowledge of the currently valid regulations.

WARNING! Danger of injury!

In case of inappropriate use of the machine the danger of serious dangers to persons or objects exists. Maintenance- and cleaning works are therefore only allowed to be done by qualified expert personnel or personnel specially qualified for the job.

WARNING!

Works at the machine are only allowed during standstill times of the machine and plant. Therefore, before works at the machine or plant, switch it off and save it against restart.

During all works regarding the operation, assembly and maintenance, the necessary measures of protection and switch off procedures described in the operating instructions have to be observed.

During all interruptions of operation it has to be made sure that all necessary protecting devices are fully functioning.

After all works at the machine it has to be checked, whether all safety devices are applied and faultless functioning.

Safety devices are not allowed to be bridged over or put out of function!

WARNING!

Works at the machine have generally to be done by qualified and specially qualified personnel.

As a basic principle, persons have to wear the following items while working at the machine:

– tight working clothes
(no loose sleeves, no rings or other jewellery, etc.)

– Protection Glasses
for the protection of the eyes against splashing objects

– Protection Gloves
for the protection of the skin against injuries

– Protection Shoes
for the protection against heavy objects falling down and slipping on slippery ground

WARNING! Danger by electricity!

Works at electric devices have to be executed by qualified expert personnel under observance of the current security regulations only.

Before starting of the works, the main switch has to be switched off and has to be made safe against restarting.

WARNUNG! Danger of injury!

Parts of the machine, which have been stopped but are further running for a certain time, may cause serious injuries. Before maintenance and repair works, urgently switch off the complete plant and make safe against restart. Begin to work after complete standstill of the plant only.

After having finished the works and before restarting the plant, it has to be checked, whether all safety devices are re-fixed and faultlessly functioning.

8.2 Lubricants

Mineral oils and lubricating grease may contain additives, which may lead to detrimental impacts in certain circumstances.

WARNING! Danger of Toxication!

Lubricants are harmful to health! When oil or lubricating grease gets in touch with skin, skin may be damaged (skin irritation, inflammation, allergies, etc.).

Therefore:

- **Observe instructions and security data sheets of manufacturer!**
- **Avoid longer, excessive and repeated contact with skin.**
- **During handling with lubricating grease and care products or oil resistant gloves, always use appropriate skin protection.**
- **Splashes in the eyes have to be washed away with lots of water immediately!**
- **dirty skin because of lubricating grease has to be washed with water and soap immediately.**

WARNING! Danger of injury!

Lubricating grease spilled on the ground has to be seen as a source of danger because of slippery ground. Lubricating grease on the ground has to be bound by dispersing saw dust or other oil adsorbents and has to be removed.

8.3 Maintenance Plan

In regular intervals, maintenance works will be necessary. You may see the details in the table below:

Interval	Maintenance Works	with
10 hours of operation	grease the trapezium spindles	e.g. clear machine grease
10 hours of operation	oil the linear guide ways	e.g. thin machine oil
100 hours of operation	**grease the 3 lubrication fitting**	**e.g. clear machine grease**
acc. to demand	clean the CNC-Milling Machine from the outside	with a soft and dust-free cloth

8.4 Maintenance works

Every 10 hours of operation:

Oil the trapezium spindles (1 to 4) with a light oil (e.g. sewing-machine oil).

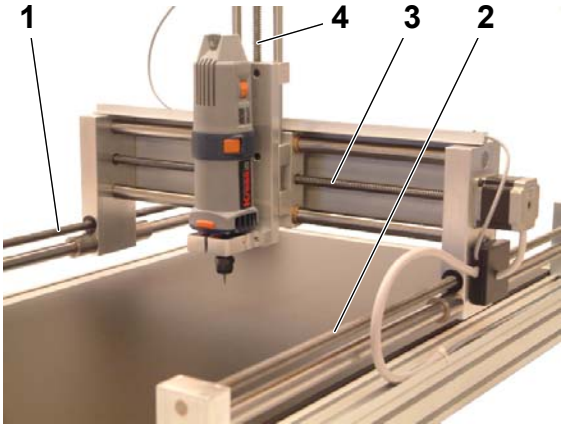


Illustration No. 13: Trapezium Spindles

Every 10 Operating hours:
Oil linear guide ways (5 to 8) with light oil (e.g. sewing-machine oil).

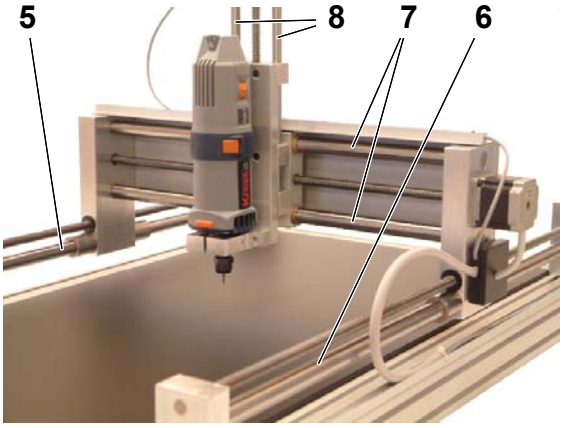


Illustration No. 14: Linear Guideways

All other parts of the CNC-Milling Machine are maintenance-free.

8.5 Measurements after maintenance works

After the maintenance works have been done, before switching-on the machine, in addition to the current security regulations, the following items have to be observed:

- Check, whether all protection devices, coverings and container caps having been removed before, are correctly tightened again.
- make sure that all used tools, materials and other equipment have been removed from the working area again.
- clean the working area and remove possibly leaked substances, e.g. fluids, material from the working piece or similar dirt.
- Make sure that all security devices of the machine are fully and fault-free functioning again.

9 Disturbances

Disturbances at electric devices are only allowed to be solved by qualified expert personnel. The same applies for disturbances affecting the mechanical areas.

Please inform manufacturer, in case disturbances cannot be solved by the aforementioned measurements.

9.1 Steps to be taken in case of disturbances

In case of disturbances meaning a direct danger for persons, objects and the operational security of the machine or plant, the machine has to be stopped immediately with the EMERGENCY-STOP button.

In case of minor disturbances, the machine or plant has to be switched-off in the normal way by the machine control.

In any case, the operating company has to be informed immediately about the disturbance. The operating company has to instruct the respective expert personnel, which has to determine the nature of the disturbance and to eliminate the cause of it.

Before, during and after the works for eliminating the disturbances, the indications in chapter "Maintenance" have to be observed!

9.2 Disturbances

Nature of Disturbance	Cause	Steps To-Do
Standstill of stepping motor	Overload stepping motor (X-, Y- and/or Z-Axis)	New adjustment, i.e. zero-points.
Pulse-length reduction *(Schrittverlust)*	Overload of stepping motor for X-Axis (X1 and/or X2)	Switch off machine! Check Y-Axis to Z-Axis upon right angle. **! ATTENTION!** **In case of non-observance to right angle, damage to mechanic items may occur.** New adjustment, i.e. zero-points.
Pulse-length reduction *(Schrittverlust)*	Overload of stepping motor for Y-Axis and/or Z-Axis	New adjustment, i.e. zero-points.

10 Spare parts

Please urgently state with spare part orders:

- type of machine
- Serial-No.
- Quantity
- exact Name /Identification
- Required type of despatch (mail, freight, sea, air, express)
- Address for Despatch

Spare part orders without the above mentioned information cannot be taken into consideration. Should the information regarding type of despatch be missing, despatch will be effected according to discretion of supplier.

A

Accessories 19, 30
Accident 13
Appropriate Use 10

B

Beginning of Operation 22, 27

C

Change of Tools 29
Characteristics 15
Clamping of Working Pieces 28
Composition/Configuration 16
Connection of the Stepping Motors 25
Connection of the Stepping Motor Control 25
Connection of the Tools 25
Copyright-Protection 7

D

Dangers 11, 13
Disturbances 35

E

Ear Protection 11
EMERGENCY-STOP button 12, 24

F

Function 16, 17

G

Gear 15

I

Installation 22, 24

L

Liability 7

M

Maintenance 31
Maintenance Plan 33
Maintenance Works 33
Measurements 14

N

Name Plate 17

O

Operating Control 29
Operating Personnel 12, 28
Operation 28, 29
Operational Safety 10
Operating Company 9
Operating Instructions 6

P

Packing 21
Place of Installation 22
Protection Equipment 11
Protection Glasses 11
Protection Shoes 11

Q

Qualified Expert Personnel 12, 31

S

Screw Clamping Torque 23
Security 9, 31
Stepping Motor 15
Stepping Motor Control 19
Spare Parts 7, 36
Storing 21
Symbol Legend 6
System Control 12

T

Technical Data 14
Tools 19, 26
Transport 20

Transport Inspection 20

U

Temperature of surrounding area 23, 28

W

Warranty 7
Weights 14
Waste Disposal 21
Working Clothes 11
Working Plate 26
Working Desk 19

Z

Z-Kit 19